Multi-disciplinary management of complex pressure sore reconstruction: 5-year review of experience in a spinal injuries centre

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ABSTRACT

INTRODUCTION In our regional spinal injuries unit, complex pressure ulcer reconstruction is facilitated by a monthly multidisciplinary team clinic. This study reviews a series of the more complex of these patients who underwent surgery as a joint case between plastics and other surgical specialties, aiming to provide descriptive data as well as share the experience of treating these complex wounds.

MATERIALS AND METHODS Patients operated on as a joint case from 2010 to 2014 were identified through a locally held database and hospital records were then retrospectively reviewed for perioperative variables. Descriptive statistics were collected.

RESULTS 12 patients underwent 15 procedures as a joint collaboration between plastic surgery and other surgical specialties: one with spinal surgery, 12 with orthopaedic and two with both orthopaedic and urology involvement. Ischial and trochanteric wounds accounted for 88% of cases with five Girdlestone procedures being performed and 12 requiring soft-tissue flap reconstruction. Mean operative time was 3.8 hours. Four patients required high-dependency care and 13 patients received long-term antibiotics. Only three minor complications (20%) were seen with postoperative wound dehiscence.

DISCUSSION The multidisciplinary team clinic allows careful assessment and selection of patients appropriate for surgical reconstruction and to help match expectations and limitations imposed by surgery, which are likely to influence their current lifestyle in this largely independent patient group. Collaboration with other specialties gives the best surgical outcome both for the present episode as well as leaving avenues open for potential future reconstruction.

KEYWORDS

Pressure ulcer – Reconstructive surgical procedures – Spinal injuries – Surgery – Plastic – Orthopaedics – Urology

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Introduction

The James Cook University Hospital provides one of 11 spinal injury units in the UK. As a part of this service, a specialist multidisciplinary team (MDT) was set up for the management of pressure ulcers arising in this patient group. The team meets once a month. Over the 5-year period from January 2010 to December 2014, this MDT has seen and reviewed 222 patients. The MDT is run as a clinic where patient, carers, spinal injury nurse specialists, spinal injury consultant and plastic surgery consultant meet to discuss not only the patient's wound and suitability for surgery but their lifestyle, requirements and expectations of a surgical reconstruction, other impacting medical problems, expected postoperative recovery and rehabilitation, as well as relevant social circumstances. Involvement of the patient and shared decision making is a key part of this MDT, which empowers patients to be active parties in their care and improve outcomes. Imaging and other opinions are then requested as needed and suitable patients are selected for surgical management. In more

complex cases, where bone involvement or urological problems are expected, arrangements are made to proceed as a joint case with the relevant specialty.

The aim of this study was to review the experience of the MDT in the operative management of these complex cases undertaken as joint procedures between more than one surgical specialty. This was done with a view to providing both descriptive data for this subgroup of patients as well as describing the experience gained of managing these cases.

Management of pressure ulcers in spinal cord injury patients

Pressure ulcers are wounds that develop over a bony prominence, owing to a combination of pressure and shearing forces.¹ Patients with spinal injuries are at increased risk of developing these ulcers, owing to a lack of sensation, poor mobility, wheelchair dependence, autonomic dysfunction, muscle atrophy and muscle spasm.² Prevention is the key for these patients as, once an ulcer has developed, even if

relatively minor, the resulting bed rest and inconvenience to lifestyle required to allow the wound to heal is disproportionately long. Patient education and support to provide and maintain pressure relieving devices, ensure safe transfers and ongoing advice plays a vital role in prevention.

Surgical management of pressure ulcers firstly requires adequate debridement of the soft tissue and underlying involved structures. If osteomyelitic bone is present, this should be removed, but radical resection beyond removal of infected tissue is not recommended.⁵ If an ischial ulcer is in close proximity to the anus, the consideration of elective defunctioning colostomy should be discussed. Workhorse flaps for pressure ulcers in the pelvic region include gluteal rotation, posterior thigh/hamstring flaps, tensor fascia lata and vastus muscle flaps. In the patient with multiple pressure ulcers, it has been shown that simultaneous

reconstruction of more than one in a single procedure is feasible (Fig 1),⁴ but postoperative positioning to avoid pressure on suture lines needs to be considered.

Reported long-term success is variable, with recurrence rates of up to 61% being reported.⁵ In a multivariate analysis of risk factors for flap failure, Keys *et al* found that poor diabetic control and low albumin were associated with early recurrence, whereas younger age, ischial pressure sore location and previous recurrence predicted late recurrence.⁶ One study looking at perioperative education found that individualised education programmes with monthly telephone follow-up significantly reduced the rate of recurrence to 33% over a 2-year period.⁷ Benefits of surgical reconstruction include both physical and psychosocial elements. Physiological benefits include haemoglobin and serum protein levels improving significantly over a 6-month period and, from a psychosocial

Figure 1 Example case (patient 1 in Table 1) of complex pressure ulcer reconstruction in a patient with a T3-level spinal injury: 1) preoperative – right grade 4 trochanteric and ischial pressure ulcers with underlying osteomyelitis; 2) post-debridement and Girdlestone procedure showing extent of defect; 3) elevation of gluteal myocutaneous rotation flap; 4) vastus lateralis and tensor fascia lata muscle flap elevated and transposed to fill post-debridement defect; 5) gluteal myocutaneous flap advanced to allow closure; 6) 3 weeks postoperatively with satisfactory healing

point of view, patients also report better self-esteem (86.6%), personal hygiene (93.3%) and overall improvement in subjective wellbeing (76.6%).⁸

Method

This study retrospectively reviewed all spinal injury patients who required both plastic surgery, as well as any other surgical specialty to be present for their reconstructive procedure from 2010 to 2014. Patients were identified using a database of all spinal injury cases who have undergone a surgical procedure, which is maintained prospectively by the plastic surgery department. Case notes were then reviewed retrospectively to obtain data.

Data were collected on a Microsoft Excel® spreadsheet with pre-agreed criteria to assess pre-, intra- and postoperative factors. Basic demographic data and details of past medical history were also recorded. This database did not contain any patient identifiable data and was stored securely. Hospital software packages were used to confirm details of preoperative imaging and duration of hospital stay.

Results

From January 2010 to December 2014, 47 procedures were performed under the care of plastic surgery to reconstruct pressure sores in spinal injury patients. Of these, 12 patients underwent 15 procedures, which required the input of at least one other surgical specialty (Table 1).

Preoperative

The mean age of these patients was 44.6 years (range 21–69 years) and the most common cause of spinal cord injury was trauma (50%) followed by spina bifida (33%), with spinal infarction and Guillain-Barre syndrome each representing 8%. Comorbidities were frequent, with a mean of 2.3 per patient. Location of the pressure ulcer was dominated by ischium (50%) and greater trochanter (38%), accounting for 88% of operated wounds. All patients underwent preoperative cross-sectional imaging with a mean of one magnetic resonance image (MRI) and 0.7 computed tomography (CT) scans per procedure.

Intraoperative

Orthopaedic surgeons were the most frequently seen co-operators in 14/15 procedures and, in 2 of these cases, urology was also involved. A spinal surgeon was the co-operator for one case. This distribution of surgical specialty input was also reflected in the procedures performed, with, in addition to soft tissue and bone debridement, five Girdlestone procedures and two urethral repairs recorded. One patient also underwent a tracheostomy change by the anaesthetist at the same sitting as a combined elective procedure. Direct closure of the wound was possible in three cases, with nine cases requiring one reconstructive flap and three requiring two flaps (Fig 1). The most commonly performed flap was the gluteal myocutaneous rotation flap (9/15) followed by the tensor fascia lata (5/15) and vastus muscle (3/15) flaps, usually to fill the dead space from a girdle stone procedure (Fig 2).

Antibiotic prophylaxis was administered in all cases with considerable variety seen in antibiotic choice. Teicoplanin was the most frequently used antibiotic (8/15), followed by the combination of cefuroxime and metronidazole (6/15); most patients received a combination of two or more (11/15). Operative time was considerable, as would be expected with such complex cases, with a mean duration of 3.8 hours (range 1–7 hours). Positioning also adds an extra complexity, with 47% prone, 40% lateral and the remaining 13% either supine or in lithotomy, with collaboration between surgeons and anaesthetist determining the optimum choice.

Postoperative

Postoperatively, four patients required high-dependency care. Mean length of inpatient stay following the procedure was 37.4 days (range 3–84 days). Three patients also had a prolonged inpatient stay prior to their surgery, with the longest total inpatient stay of 141 days. Thirteen patients required a prolonged course of antibiotics, as guided by the microbiology team, with a mean duration of 7.3 weeks, and eight patients required insertion of a Hickman line to complete this course. Three complications were seen in two patients, requiring return to theatre for debridement and resuture on two occasions and readvancement of a gluteal myocutaneous rotation flap on one occasion.

Post-discharge

There is a minimum of 8 weeks of total bed rest following surgery, so patients are discharged from the spinal injuries centre with an appropriate package of care at 2–4 weeks postoperatively, to continue this bed rest at home. This package of care needs to allow total bed rest on an air mattress and so provision needs to be made for help with turns, bowel care, bathing and meals. Contact is maintained through the specialist nursing team, who visit patients regularly throughout this period. These visits also allow any concerns to be picked up early and discussed with the surgical team.

Once the wound is fully healed, readmission is arranged to commence mobilisation. This starts very gently and initially only 30 minutes of sitting is allowed on the first day, with close monitoring of the surgical site as well as using pressure mapping and Roho® cushions (Roho Inc, Belleville, IL, USA) for maximum protection. This period of rehabilitation is progressed on an individual basis and is therefore continued over a variable number of weeks. Following discharge, a specialist nurse will visit the patient at home within 2 weeks and an outpatient follow-up is also arranged for the MDT clinic. As the spinal injuries unit caters for a very large geographical area, the specialist nursing team provide an invaluable service by keeping in touch with patients and minimising the number of unnecessary long journeys for patients.

Discussion

The role of the spinal injuries MDT is central in the management of pressure ulcers in the patient population cared for by this unit. Firstly, it allows assessment of the wound in question and suitability for surgical reconstruction. This

Table 1 Summary of 15 cases											
	Age	Primary diagnosis	Comorbidities (n)	Additional specialty involvement	Reconstruction	Duration of procedure (hours)	Positioning	Duration antibiotic course (weeks)	Hickman line	Post-operative inpatient stay (days)	Complications
1	49	infarction	3	ortho	G & VL/TFL	7.0	lateral	12	yes	84	Partial dehiscence – debridement and resuture
2	51	infarction	3	ortho	Direct	2.8	lateral	6	yes	50	
3	22	spina bifida	2	ortho	G	4.5	prone	0	no	21	
4	28	trauma	0	ortho	Direct	3.5	lateral	6	yes	65	
5	40	trauma	4	urology & ortho	G & PT	4.0	lateral	8	yes	49	
6	61	trauma	2	ortho	TFL	3.3	supine	8	yes	23	
7	40	spina bifida	0	ortho	Direct	1.0	prone	0	no	3	
8	24	spina bifida	3	ortho	G	3.0	prone	3	no	21	
9	33	trauma	2	ortho	VL/TFL	3.8	lateral	13	no	25	
10	29	trauma	2	ortho	TFL	2.0	lateral	3	no	34	
11	55	trauma	2	spinal	G	4.0	prone	12	yes	23	
12	47	Guillain-Barre	3	ortho	G	3.8	prone	5	no	37	
13	54	trauma	4	urology & ortho	G & VL/TFL	5.0	lithotomy	16	yes	36	
14	68	spina bifida	3	ortho	G	6.0	prone	3	no	28	Partial dehiscence – debridement and resuture
15	69	spina bifida	3	ortho	G	3.3	prone	14	yes	62	Partial wound – debridement with readvancement of flap and resuture
G = Gluteus myocutaneous, ortho = orthopaedics, PT = posterior thigh, TFL = tensor fascia lata, VL = vastus lateralis.

in itself requires careful planning, with all patients in this cohort undergoing cross-sectional imaging to assess the extent of the defect and assess underlying structures which may be involved. Often, opinions are sought from other surgical specialties, as their management plan will likely impact on the method of soft-tissue reconstruction as well as theatre time and resources. As many of these patients are young, the high likelihood of pressure ulcer recurrence also needs to be taken into account to avoid burning bridges for further reconstruction, which may be required in the future. Other medical comorbidities and physical limitations need to be considered; for example, if the patient is unable to lie in a position to avoid pressure on the reconstruction postoperatively then the process cannot proceed any further.

These surgical decisions are often made over at least two visits to the MDT and this provides time and space for patients to absorb and understand the proposed treatment and commitment they are making. This patient group has often managed their disability for many years with active lives and the realisation and acceptance that the development of a pressure ulcer is ultimately due to prolonged pressure, frequently from sitting for long periods, can be difficult. Counselling from both surgeon and specialist nurses is important in helping the patient to consolidate this information and the implications it has for their future. Postoperatively, a minimum 8 week period of bed rest is required before rehabilitation can start and even once this is achieved, lifestyle changes will have to be made to avoid recurrence. Additionally, if a Girdlestone procedure is required due to osteomyelitis, this will also have a significant impact on stability and ability to transfer independently. Time to consider the advantages and disadvantages of the proposed treatment and allow patients to reach an informed decision is therefore vital.

Once a plan has been made, an appropriate time and theatre space needs to be determined to suit all surgical and anaesthetic teams. Adequate time needs to be allowed as, in addition to operative time, more time is needed from an anaesthetic point of view, owing to the complex medical needs and to safely position the patient, which may be complicated by joint instability and contractures. In this cohort, mean operative time was 3.8 hours, with some procedures requiring considerably longer. Coordination between surgical teams is required for planning of incisions so as to allow adequate access for debridement without compromising flap territories. This often means that the plastic surgery team will provide initial surgical access and then assist the orthopaedic and/or urological team in their role before completing the procedure with the planned soft tissue cover.

Postoperatively, patients are managed in the spinal injuries unit, where both surgical and spinal injuries teams share patient care and specialist nursing, physiotherapy and dietetic input is in place. Meticulous attention to positioning is vital to minimise flap complications resulting from pressure or shear, and to prevent new pressure areas from developing in the minimum 8-week bed-rest period. Complications do occur and, as this cohort demonstrates, these are most frequently problems relating to wound breakdown. While small areas can be managed conservatively, others benefit from further debridement and resuturing and, for the cases of wound breakdown in this study, the additional procedure was successful. Owing to the complex and chronic nature of these pressure ulcers, underlying osteomyelitis is very common, with antibiotic choice and duration determined by tissue culture results as advised by both microbiology and infectious diseases teams.

Discharge planning for these elective admissions starts in the MDT clinic prior to admission, as patients will inevitably require a period of rehabilitation before they can return home. Ensuring that a place of discharge is set up prior to admission ensures efficient use of the spinal injuries unit resources by not prolonging patient stay longer than is medically necessary. This is also beneficial to the patient, as the geographical area served by the unit is widespread and timely discharge to a suitable place closer their home enables family and friends to visit more readily.

Conclusion

This model for MDT management of these complex cases provides a high level of individualised care from the outset, with the value of detailed preoperative discussion in the clinic being significant. From a patient's perspective, this enables deeper understanding of what is being undertaken and allows time to build up trust with the surgical team. As decisions are made as a joint collaboration between patient and doctor, clear and attainable goals can be set. This in turn provides greater motivation to sustain and support the patient through the, at times, frustrating postoperative regime, leading to improved outcomes and fewer problems.

Intraoperative collaboration is vital, with preservation of vascular territories the key to maintaining options for future surgery. The MDT approach therefore enhances the surgical

planning process, with expertise from all specialties combined to maximise gain from the procedure in question while respecting potential future needs. This makes the best use of all resources for an effective and, it is hoped, long-lasting solution in terms of patient time, effort and tissue availability. Obtaining a successful result also has benefits in terms of healthcare resources with less input need for the management of an open wound and associated complications such as infection.

Overall, this MDT approach maximises the potential for a successful outcome at every stage of the process, starting from the appropriate counselling of patients and setting useful, achievable goals to optimising expertise in surgical planning as well as in the operating theatre. The benefits of development of a robust patient–team relationship should also not be underestimated in terms of improved communication and greater patient autonomy, which results in better outcomes for both current and future care.

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